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GEOPHYSICAL ABSTRACTS

XIV

BY

FREDERICK W. LEE

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DEPARTMENT OF COMMERCE -- BUREAU OF MINES

GEOPHYSICAL ABSTRACTS[1]

No. 14

Compiled by Frederick W. Lee[2]

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1. GRAVITATIONAL METHODS

EIN DIAGRAMM ZUR BESTIMMUNG DER DIFFERENZ DER SCHWERESTÖRUNG $\triangle G$ IN ZWEI BEOBACHTUNGSPUNKTEN

(A DIAGRAM FOR THE DETERMINATION OF THE DIFFERENCE OF GRAVITY DISTURBANCE $\triangle G$ IN TWO POINTS OF OBSERVATION)

By W. Oserezky

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 69-71.

The author describes a diagram with the aid of which the difference of the anomalies of the force of gravity $\triangle g$ in two points of observations made by the torsion balance can be determined without any calculation.

The scale of the plane on which the vectors are drawn and that of the diagram must, of course, be taken into consideration. The method of using the diagram, which is traced on glass, by superposing it upon the plane is explained by means of a figure.--W. Ayvazoglou.

ÜBER DEN HORIZONTALABSTAND VON PENDELSTATIONEN

(ON THE HORIZONTAL DISTANCE BETWEEN PENDULUM STATIONS)

By Robert Schwinner

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 111-114.

Geological interpretation requires that the difference between the values obtained by two neighboring gravity stations shall always have a correct sign. Therefore, the author proposes that the pendulum stations chosen on a cross section be at such a distance one from another that the value of the probable difference becomes six times as great as the value of the mean error of the measurements. Author's abstract, translated by W. Ayvazoglou.

DIE BELOWSCHE METHODE ZUR BESTIMMUNG DER WIRKUNG GEGEBENER MASSEN AUF KRÜMMUNGSGRÖSSE UND GRADIENT, IHRE VERALLGEMEINERUNG FÜR BELIEBIGE MASSENFORMEN UND IHRE ANWENDUNG AUF "ZWEIDIMENSIONALE" MASSENANORDNUNGEN

(BELOW'S METHOD FOR THE DETERMINATION OF THE EFFECT OF GIVEN MASSES UPON THE CURVATURE VALUE AND GRADIENT, THEIR GENERALIZATION FOR ANY FORM OF MASSES AND THEIR APPLICATION TO "TWO-DIMENSIONAL" ARRANGEMENT OF MASSES)

By Karl Jung

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 114-123.

Below's method, mentioned in Nikiforov's article "Physical principles of the gravitational method of prospecting" (see Geophys. Abst. 2), concerning the proceeding of topographic correction of the curvature value and of the gradient for far remote parts of the terrain is discussed. The author shows how this proceeding can be applied for any form of the mass and how it can be transferred to the determination of the effect of "two-dimensional" deposits. Diagrams showing Below's method are given and their use is explained. List of literature is added.--W. Ayvazoglou.

DIE UNDULATIONEN DES GEOIDS UND DIE SCHWEREANOMALIEN

(UNDULATIONS OF THE GEOID AND GRAVITY ANOMALIES)

By W. Heiskanen

Gerlands Beiträge zur Geophysik, vol. 25, No. 2, 1930, pp. 148-154.

Hopfner maintains the opinion that the gravity anomalies in mountains and on oceans can be explained without the isostatic principle, solely by Bruns' terms. In the present essay it is shown that in such a case the geoid beneath the Alps and in the Rocky Mountains must be considered to be situated about 350 meters over and on the oceans about 1,000 meters under the spheroid and that the deflections from the vertical would amount in Lombardy and Bavaria to about 16 feet and in Ireland, Spain, and California to 3 to 6 feet. But as these values are in contradiction with observations, Hopfner's assertion must be considered as inconclusive.--Author's abstract.

ZUR GROSSE DER GEOIDUNDULATIONEN UND IHRER BERECHNUNG AUS LOTABLENKUNGEN

(ON THE VALUE OF GEOID UNDULATIONS AND THEIR CALCULATION FROM THE DERIVATIONS OF THE PLUMB LINE)

By F. Hopfner

Beiträge zur Geophysik, vol. 25, No. 2, 1930, pp. 155-162.

In vindication of their methods of work and in order to insure the results obtained by them, the representatives of the method of isostatic reduction in geodesy try to prove that the undulations of the geoid are probably very minute. In this article the author shows that the reasons brought up by them can not stand the test.--Author's abstract.

RECENT PROGRESS IN GRAVITY DETERMINATIONS AT SEA

By C. H. Swick

Geographical Review, vol. 20, No. 2, 1930, pp. 278-282.

Swick describes the results of some gravity determinations at sea performed by Dr. Meinesz for studying ocean areas in order to establish whether isostasy exists there and, if so, what the variations from the ideal condition are.

The new Meinesz apparatus, used by him during his last expedition in 1929, is arranged so that the combined or relative oscillations of the two pendulums of a pair are traced directly on the record instead of the oscillations of each pendulum separately, as in the original apparatus. In addition to the enormous saving of time in making computations, the accuracy of the derived quantities is increased and there is less opportunity for making errors in the computations. A brief description of the present apparatus is given.

The computation of the isostatic reductions at the 250 stations determined during the expeditions has been made by the Coast and Geodetic Survey, and the author states that isostasy exists over the oceans to almost the same complete extent that it does over land areas; the gravity formulas, which are now based entirely on land determinations, must, however, be somewhat modified.— W. Ayvazoglou.

2. MAGNETIC METHODS

ÜBER TÄGLICHE ERDMAGNETISCHE VARIATIONEN IN ZWEI ALPENTÄLERN

(CONCERNING DIURNAL EARTH-MAGNETIC VARIATIONS IN TWO VALLEYS IN THE ALPS)

By J. Koeningsberger

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 74-78.

Several diurnal variations of Z, H, and δ were observed in two deep valleys in the Swiss Alps. A comparison with variations observed in Seddin (Potsdam) and Val Joyeuz (Paris) shows that the disturbances of more than 5γ amplitude and less than 10 minutes of duration occurring at these two stations could not be observed at that time in the valleys of the Alps. In these Alpine stations, which are situated more to the south, the curves were very smooth.— Author's abstract, translated by W. Ayvazoglou.

RESULTATS DES MESURES MAGNETIQUES FAITES SUR LE MASSIF DE SEL D'HETTENSCHLAG (HAUT-RHIN)

(RESULTS OF MAGNETIC MEASUREMENTS MADE OVER THE HETTENSCHLAG SALT MASSIF IN UPPER RHINE)

By P. Geoffroy, Th. Koulomzine, and A. Gorodisky

Annales des Combustibles Liquides, vol. 4, No. 6, 1929, pp. 1,015-1,021.

The Hettenschlag salt massif was discovered by the electrical method of prospecting. The discovery was confirmed by borings. The purpose of this article is:

1. To show that the magnetic anomalies of the massif are of a measurable value.

2. To prove that the measurements are sufficiently accurate for the establishment of the influence of the massif.

3. To compare the magnetic anomalies with the electric ones.

Measurements were made from December 22 to 28, 1928. Haalck's variometer was used. The values of the anomalies at 30 stations, distributed along two profiles, are given in a table. The coincidence of graphical representation of the results obtained by both methods must be considered to be good.—W. Ayvazoglou.

MAGNETOMETER SURVEY OF LITTLE FRY PAN AREA, UVALDE AND KINNEY COUNTIES, TEXAS

By R. A. Liddle

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 4, 1930, pp. 509-517.

Magnetometer investigations of igneous intrusions along the western end of the Balcones fault zone in the southwestern part of Texas show that the intrusions are highly magnetic. Some plugs are positive and others negative; in several, splinters of igneous rock were found to be polarized. The results of the work in this area indicate that the magnetic instruments can be used with success to determine the presence or absence of buried igneous intrusions.—Author's abstract.

TEMPERATURE-COMPENSATION AND ADJUSTMENT OF MAGNETIC VARIOMETERS

By H. E. McComb and A. K. Ludy

Terrestrial Magnetism and Atmospheric Electricity, vol. 35, No. 1, 1930, pp. 29-35.

The authors describe a horizontal-intensity variometer of the Schulze type installed at the Tucson (Arizona) Magnetic Observatory in November, 1929. The instrument is provided with equipment for temperature-compensation, scale-value control, and a thin prism for production of a reserve spot. In addition to these improvements the variometer was equipped with a quartz-filament suspension, the tips of which were bent at right angles before attachment to the supports.

The instrument has been functioning in a very satisfactory manner. A description of some of the instrumental details, technique of manipulation of the filament, and subsequent adjustments is given.

The instrument was compensated for temperature, and the effectiveness of this compensation was checked in a short time by determination of base-lines when the instrument was operated at different temperatures.--W. Ayvazoglou.

DEPTH FINDING BY MAGNETIC TRIANGULATION

By Noel H. Stearn

Engineering and Mining Journal, vol. 129, No. 8, 1930, pp. 396-399.

The system of applying the magnetic triangulation method of depth-finding described in this article has yielded the following results in two known cases:

	Well log depth, feet	Calculated depth, feet	Discrepancy, feet	Per cent
Sheridan peridotite	2,254	2,320	66	2.9
Rison peridotite	3,561	3,671	110	3.1

These results are well within usable limits of error. The author explains, however, that these two cases offer what are in some respects exceptionally favorable geological set-ups for the application of the method, although possibly not the most favorable. H. R. Aldrich points out that more favorable geological conditions would be encountered in measuring the depth to a regular east-west ridge such as might be formed by a buried iron formation.

On the other hand, G. C. Branner, State Geologist of Arkansas, has reached the conclusion that less favorable geological conditions would be offered by a large and irregular intrusive mass, but that usable results may be obtained from many combinations of geological conditions is clearly indicated.

Economy of operation of this system is assured by the fact that the equipment required consists of a single instrument capable of rapid manipulation. An idea of the time element involved can be gained from the accompanying data from the field tests.

This time schedule involves the depth-finding data alone, after the anomalies had been previously located and outlined.

	Field work	Computation and plotting
Sheridan peridotite....	2 hrs.	1 1/2 hrs.
Rison peridotite........	4 hrs.	2 1/2 hrs.

Certain limits to the applicability of this use of the magnetic triangulation method are established instrumentally by the dipping circle feature of the Hotchkiss Superdip.

The procedure here outlined can be applied only to those anomalies which produce a sufficiently marked change in the inclination of the earth's field to be readable on the instrument. This can be read to about 15 minutes of arc. The variation produced by the Sheridan plug amounts to 1 1/2 degrees. Clearly there is a considerable margin of applicability to smaller anomalies.

Of course, magnetic inclination can be read to within much finer limits of error on a standard dipping circle. But whether anomalies which produce changes in magnetic inclination of less than 15 minutes of arc are of sufficient magnitude to warrant attempts at depth finding is yet to be established.--Author's abstract.

USE OF MAGNETOMETER IN SOUTH TEXAS

By L. Spraragen

The Oil and Gas Journal, vol. 28, No. 52, 1930, pp. 42, 138-139.

Spraragen discusses the possibility of a magnetometer survey in south Texas, as there exists an erroneous impression that it can be of no assistance in that section.

Several illustrative examples of magnetometer surveys made on the type of structure usually sought for in the south Texas counties are given. In conclusion the author says: "It is hoped that the few examples cited in this paper will clearly and effectively point out to the reader the following facts: First, that the magnetometer can be used to advantage in outlining Serpentine plugs; second, that the magnetometer has some value, depending on accuracy, for fault survey work; third, that if readings are taken with a high degree of accuracy the contour interval can be taken at 5 or 10 gamma and in such a case a map contoured on a 5-gamma interval actually reveals structural conditions which otherwise would have been passed over with the magnetometer.

"Therefore it should be emphasized that the magnetometer work in south Texas is a matter of accuracy, requiring considerable foot work and Brunton surveying." Maps showing the results of the magnetometer surveys in different counties (Bastrop, Caldwell-Dale Field, Medina, Caldwell-Buchanan Field, Guadalupe and Gonzales) are added.--W. Ayvazoglou.

3. SEISMIC METHODS

DIE WIRKUNG DER OBERSTEN ERDSCHICHT AUF DIE ANFANGSBEWEGUNG EINER ERDBEBENWELLE

(THE EFFECT OF THE UPPERMOST EARTH LAYER UPON THE INITIAL MOVEMENT OF AN EARTHQUAKE WAVE)

By M. Hasegawa

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 78-98.

If a longitudinal sine wave penetrates into the uppermost earth layer, then one point on the surface performs an elliptical oscillation, the path of which lies in the plane of incidence. If the arriving wave is a single longitudinal impulse, then the movement of the point consists of a series of impulses.

If the first impulse is influenced by the following ones, the deformation of the horizontal and vertical components of the first one are not equal. In this article the author examines how the apparent emergency angle of the initial movement changes, in case of the incidence of the sine-shaped shock, with regard to the period of the wave and the thickness and elasticity of the layer.

As an example of the application to the method of prospecting of the underground the author establishes by this new method the depth of the so-called Mohorovcic layer in Japan. A value equal to 55 kilometers was found for Kyoto.—Author's abstract, translated by W. Ayvazoglou.

UEBER DIE ELASTIZITAT DER GESTEINE

(ON THE ELASTICITY OF ROCKS)

By Hans Breyer

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 98-111.

In this article an account is given of the investigation of some German congelation rocks, dwelling especially on the determination of their elasticity moduli, elastic changes, and permanent alkaline changes, and taking into consideration the structure. The author determined that German rocks are, as far as their elastic properties are concerned, similar to the corresponding American rocks, and that in case of equal pressure the basic rocks possess a higher elasticity modulus, a smaller elastic change of form, and a smaller permanent change of form than the acid rocks.

The author finds it necessary that, as is already done with steel and iron, the elastic properties of the rocks be statically investigated also; and, owing to the importance of engineering construction, that road building and ballasting of railroads be also examined dynamically with regard to their resistance against oscillating stress. The procedure of the experiment is described and a list of rocks tested given.

The arrangement of the mirror apparatus which served for taking the measurements is explained, and a sketch of it is given. The results of the experiments are shown graphically. In conclusion the author compares, in a table, the values of the rocks tested with those obtained by Adams and Williamson, as well as by Adams and Coker.—W. Ayvazoglou.

HARMONISCHE SCHWINGUNGEN DES UNTERGRUNDES

(HARMONIC OSCILLATIONS OF THE UNDERGROUND)

By R. Köhler

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 123-126.

The existence of oscillations of single layers in the underground is still in question, as the results of experiments are somewhat contradictory.

Köhler points out that at least the existence of harmonic oscillations of single layers can be proved.

Seismic investigations described in this article were made by the Geodetic Institute in Potsdam under the direction of Prof. Angenheister. Two differently constructed horizontal seismographs were used. The results are discussed on the basis of the seismograms obtained.—W. Ayvazoglou.

NEW SEISMOGRAPH FOR GEOPHYSICAL SURVEY

By A. O. Rankine

The Mining Magazine, vol. 42, No. 3, 1930, pp. 147-150.

A brief description, illustrated by photographs, of the new seismograph is given in this article. Its principal features are indicated. A more complete description of the working parts of the instrument may be found in British Patent 17402/29.

According to the author of this article, tests made in his presence during April, 1929, have shown good results and it was apparent that the sensitivity of the instrument was considerably superior to that of other mechanical seismographs then on the market. A reproduction of two records taken with this instrument of small explosions of gelignite (1 pound, distance 1,200 yards; and 1 1/2 pounds, distance 1,200 yards) buried a short depth in chalk is added.—W. Ayvazoglou.

A FIELD TEST WITH A NEW SEISMOGRAPH

By H. Shaw

Mining Magazine, vol. 42, No. 4, April, 1930, pp. 201-212.

Tests with a new electrical seismograph devised by the Cambridge Instrument Co. were conducted over an area which is well known, as regards subsurface structure, from a previous gravity survey and from bore-hole information.

The object of the investigation was to test the applicability of the seismic method to the location of simple structures and to ascertain the suitability of the Cambridge instrument for this purpose. The area is known to be traversed by a well-marked fault, the position, strike, and throw of which have already been determined fairly accurately, and in order to investigate this fault, three profiles were shot across it in a direction perpendicular to the strike. From an examination of the resulting time-distance curves, the position and throw of the fault are found to coincide very closely with the characteristics assumed from other data.

In addition to this a profile was shot parallel to and on the upthrow side of the fault along a line passing through a borehole, in order to determine the depth below the surface of the limestone-drift interface. This determination of the depth differed from the borehole value by only 5 per cent.--Author's abstract.

PROSPECTING WITH ARTIFICIAL EARTHQUAKES

By Karl L. Kithel

Scientific American, vol. 140, No. 6, 1929, pp. 508-511.

General principles of the seismic method of prospecting are explained. Only the simplest form of application is described. Ten figures illustrate the article.--W. Ayvazoglou.

PERIODIC RAYLEIGH-WAVES CAUSED BY AN ARBITRARY DISTURBANCE

By Katsutada Sezawa

Bulletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 2, 1929, p. 193.

The object of this paper is to solve the question as to whether the regularity of the periods of the pulsatory motion of the ground may depend on the time intervals of the disturbances or on the restitutive nature of the ground; and also to determine the nature of the long trailing train of waves of the harmonic type which follow the main tremors of the earthquake movements.

The formulation of the dispersion of waves has been obtained by assumin that in the case of the surface waves the velocity of the phase of the harmonic waves is equivalent to that of Rayleigh-waves on a stratified body and that other treatments are quite analogous to those of the ordinary surface waves. The principal results which have some importance in seismology are enumerated as follows:

1. In spite of the application of a single disturbance at the origin o a semi-infinite body of a certain dispersive nature, the generated surface waves are of a harmonic type.

2. The leading part of the train of these waves is propagated with the velocity of a special Rayleigh-type wave.

3. The periods of the successive oscillations of the harmonic displacements are of a gradually increasing nature.

4. The amplitudes of the successive oscillations are, in the case of two dimensions, of a gradually decreasing character, while in the three-dimensional problem they are more quickly decreasing.

5. The order of the length of the periods depends on the dispersive nature of the body; i.e., the elasticities, the effective thickness of the layer and some dispersive constants.

6. In certain dispersive waves there are abnormal regions of the earthquake movements at certain periodic distances from the epicentre.--Author's abstract.

THE DISPLACEMENT INDEPENDENT OF THE DILATION AND THE ROTATION IN A SOLID BODY

By Katsutada Sezawa and Gonrokuro Nishimura

Bulletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 3, 1929, pp. 389-416.

In this article the authors examine some facts which may be important in the geophysical problem as well as in applied mechanics. Although the general theory was considered by means of somewhat restricted examples, yet the theory never lost its applicability to all cases of the problem. To the dissatisfaction of the authors the various cases of the inelastic deformation could not be solved owing to the lack of time. The principal results of the present investigation are as follows:

1. The deformation of an elastic solid body in equilibrium is composed of the dilatation, the rotation, and another component which is neither dilatational nor rotational and which is an important component in affording the stresses of the strains.

2. The dilatational and the rotational components of displacement are not independent; the ratio of the constant factors belonging to these is determined only by the elastic constants of the material and the order of the harmonics of the straining. The component which is not dilatational nor rotational has an independent arbitrary constant factor.

3. The types of the solutions of the dilatational and the rotational components resemble one another, while that of the third component takes a different form.

4. By applying the present method of calculation to various cases of examples, the solutions of the various problems can be found easily. Especially the solution of the heterogeneous distributions of the material in the displacements and stresses shows that the so-called block-movement may be nothing else than the effect of such a heterogeneity of physical constants on the movements of the material points.

5. In an inelastic solid body, a nature similar to that in the elastic body manifests itself. The method of the addition of all components to obtain a complete solution in this case is somewhat complicated.

6. A new idea of investigating the problem of plasticity is obtained. The defect of the prevailing theory of plasticity, in which the condition of the compatibility is neglected, can be replaced by some improved theory.

7. The unnecessary condition of the incompressibility of the plastic material may be replaced by another controllable equation indicating the state of the material.

8. It is pointed out that the position and the number of the cracks in a strained material can not be explained by the prevailing plastic theory to the same degree as the ordinary application of the elastic theory, and that the above question can be solved even in the theory of elasticity by considering the effect of all the boundary conditions as in the manner of the students in England.

9. It is also added that the so-called block-movement advocated by the seismologists can not be explained by the plastic theory; rather it involves a great number of doubtful points when it is considered from the true theory of inelasticity as well as from some other theoretical points.—Author's abstract.

PROPAGATION OF LOVE-WAVES ON A SPHERICAL SURFACE AND ALLIED PROBLEMS

By Katsutada Sezawa

Bulletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 3, 1929, pp. 437-454.

The results of the investigation of the propagation of "Love-waves" on a spherical surface are summed up by Sezawa as follows:

"1. Long Love-waves having azimuthal distribution on a spherical surface have the large colatitudinal component of displacement, besides the ordinary azimuthal component, and this colatitudinal component can not disappear even at the equatorial circle.

"2. The vertical component is not existent from the start.

"3. The velocity of the propagation of the Love-waves on a spherical surface is approximately equal to that on a plane surface even though the waves are relatively long.

"4. The dispersion of Love-waves is possible also on a spherical surface.

"5. The growth of Love-waves toward the antipode is possible also.

"6. The azimuthal variation of displacement of Love-waves is maintained toward the antipode.

"7. In considering the neighborhood of the origin, the longitudinal component of displacement of the short waves becomes quiescent as the waves are propagated towards infinity. When the waves are generated from an internal source, the displacement at the free surface works together with the modes of the oscillations at the origin.

"8. In this case the azimuthal variation of the azimuthal displacement at the surface conforms for all radial distances to the type of the oscillations of the internal source.

"9. When the source is situated at the bottom medium, the amplitude of the surface waves decreases with the depth of the source in the bottom medium at the rate of $e^{-\beta_1 \xi}$. It is interesting to compare this with the case of Rayleigh-waves in which the amplitude of the waves is proportional to $e^{-\alpha_1 \xi}$ $(\alpha_1 > \beta_1)$.

"10. When the source is situated at the superficial layer, the amplitude of the surface waves varies at some harmonic functions of ξ."--Author's abstract.

ON THE NATURE OF EARTHQUAKES STUDIED BY MEANS OF THE SEISMIC WAVE ANALYSER

By Kyoji Suyehiro

Bulletin of the Earthquake Research Institute, Tokyo, vol. 7, No. 3, 1929, pp. 467-471.

Suyehiro states that his seismic wave analyser, which works under the principle of selective resonance, can be used for studying the nature of an earthquake by detecting successive fresh waves.

From the record given by this instrument the number of shocks in an earthquake can be detected, except when the shocks emanate simultaneously from a narrow region or continuously one after another from an extended region. The records of 16 earthquakes made by this instrument are given in a table and their values are discussed.—W. Ayvazoglou.

THE SCHWEYDAR TWO-COMPONENT SEISMOGRAPH

By A. B.

The Instrument World, vol. 1, No. 11, 1929, pp. 335-336.

After a few remarks on different types of existing seismographs and their practical application, the author describes the Schweidar two-component seismograph consisting of a double pendulum and the recording device. The recording device is placed about 1 meter distant from the pendulum and is connected with it by a light rigid funnel or telescope-jointed tube to prevent outside light affecting the sensitized paper. The operation of the recording device is described. The seismograph consists of two pendulums -- one for the vertical and one for the horizontal components. The heavy mass weighs about 1,800 grams; the reduced length of the pendulum is 6.89 centimeters; the natural period is about 0.07 seconds.

The vertical movement of the ground is made approximately horizontal by the aluminum lever and is mechanically magnified about 8 times; this magnification is increased considerably by the combination of the friction of the wire on the vertical axis with the optical lever. This magnification depends on the ratio of the focal length of the lens in front of the seismograph mirror divided by the radius of the vertical axis (lever principle) to be doubled on account of the reflection. As the diameter of the little axis is about 2 millimeters and the distance of recorder and pendulum about 1 meter, the combined magnification of friction and optics is about 2,000. Hence, with the mechanical magnification, the portable seismograph of Schweydar has a magnification of about 16,000 for infinitely small periods.

The magnification of both the vertical and horizontal pendulums, as well as their natural periods, are exactly alike. The pendulums may be used damped or undamped. The latest types have an arrangement for oil-damping.— W. Ayvazoglou.

4. ELECTRICAL METHODS

LA PROSPECTION ÉLECTRIQUE ET SES RECENTS PROGRÈS

(ELECTRICAL PROSPECTING AND ITS RECENT SUCCESSES)

By G. de Grand'ry

Revue universelle des mines, vol. 75, Series 8, Nos. 5 and 7, 1930, pp. 136-141 and 188-198.

The following electrical methods of prospecting, based on the different electrical conductivity of rocks and successfully applied in practice, are described:

1. Electromagnetic method by which characteristics of magnetic field produced in a conducting body by alternating field are determined.

2. Inductive method which differs from the first method only in the manner of producing the alternating field obtained by induction.

3. A method consisting of determining the electrical resistances.

The three methods are described and for each of them examples of application are given.—W. Ayvazoglou.

ZUR ERMITTLUNG AUSGEDEHNTER SCHICHTEN VERSCHIEDENER LEITFÄHIGKEIT

(ON THE DETECTION OF EXTENSIVE LAYERS OF DIFFERENT CONDUCTIVITY)

By J. Koenigsberger

Zeitschrift fuer Geophysik, vol. 6, No. 2, 1930, pp. 71-73.

Two geoelectric proceedings are described in order to determine the existence of layers with good or bad conductivity, the depth of their horizontal limit surface, as well as their conductivity, by means of relative measurements of the quotients of the potential difference or of the intensities obtained by the connection of the current at two points (Stromdipol). The measurements are made on the continuation of the dipole-axis, so as to avoid the disturbing influence of the leading-in wire, which is direct for alternating current, and indirect for induction. In case of layers with better conductivity, the measurement of the quotients of the potential differences by using probes is more accurate, and in case of layers with bad conductivity the more accurate way is that of measuring the quotients of the intensity. Maximum effect is obtained when the distance between the primary electrodes is approximately two or three times greater than the depth of the upper limit-surface of the layer. Faults and strikes of layers can also be determined qualitatively by measuring the quotients along four directions perpendicular one to another.--Author's abstract, translated by W. Ayvazoglou.

SUR LA DISTRIBUTION ELECTRIQUE POTENTIELLE AUTOUR D'UNE PRISE DE TERRE PONCTUELLE DANS UN TERRAIN A COUCHES HORIZONTALES HOMOGENES ET ISOTROPES

(ON THE POTENTIAL ELECTRIC DISTRIBUTION AROUND A SMALL GROUND CONNECTION ON A TERRAIN WITH HORIZONTAL, HOMOGENEOUS, AND ISOTROPIC LAYERS)

By S. Stefanesco and C. and M. Schlumberger

Le journal de physique et le radium (Publication de la societe francaise de physique), vol. 1, Series 7, No. 4, April, 1930, pp. 132-141.

The purpose of this article consists of solving the problem of distribution of potential inside of horizontal, homogeneous, and isotropic layers by means of a method based on the use of Bessel's function of the first kind. It is also possible to express by definite integrals the potential of each of these layers, no matter what the number of them, their thickness, and their specific resistivity may be.--Authors' abstract.

5. RADIOACTIVE METHODS

A CONVENIENT FORM OF GEIGER TUBE COUNTER

By L. F. Curtiss

Bureau of Standards Journal of Research, vol. 4, No. 4, 1930, p. 593.

In this article Curtiss describes a design of a new Geiger tube counter which he has found very satisfactory. When used for the detection of gamma radiation, or high velocity beta radiation, the new Geiger tube counter may readily be put in a form that is portable and independent of pumps. A figure showing the longitudinal cross section of a completed counter is given.--W. Ayvazoglou.

6. GEOTHERMAL METHODS

LES MESURES DE TEMPERATURES DANS LES SONDAGES

(MEASUREMENT OF TEMPERATURE IN BOREHOLES)

By G. Friedel and V. Maikowsky

Le genie civil, vol. 45, No. 23, 1929, pp. 568-569.

Owing to the fact that the use of medical or other types of maximum thermometers at depths over 1,000 or 1,500 meters requires their inclosure in tight-shut strong steel boxes and that the indications of the thermometers are to be corrected for high and very uncertain pressures, the use of open-tube thermometers without a graduation scale is proposed. The tube of such a thermometer is cut obliquely at its upper end at an angle of about 45° or a little more to the axis of the tube. The reservoir and the tube are filled with mercury so that the latter may rise to the orifice at a temperature which is surely inferior to that expected at the point of measurement.

Two or three thermometers prepared in this way can be lowered, protected by a simple sheet-iron box filled with clear water, as the pressure will not have a notable effect on the open tube. The thermometers should be left in the borehole for about 24 hours.

At a depth fixed for the measurement the mercury will rise above the open end of the tube and one part of mercury will escape. After the removal of the thermometers they are heated side by side with a graduated thermometer until the mercury rises again up to the orifice; this moment will show the temperature measured in the hole at the desired depth, and its amount can be read from the graduated thermometer.

Temperature curves obtained from measurements made with this type of thermometer in the potassium mines in Alsace and in the saliferous basin of the Upper Rhine varied from those obtained previously. The curves showing the distribution of the temperature at depths exceeding 1,000 meters were almost straight lines, the geothermal degree being almost constant and equal to about 25 meters.--W. Ayvazoglou.

GEOTHERMICS AS A MEANS OF LOCATING PETROLEUM DEPOSITS

Editorial Note

The Petroleum Times, London, vol. 23, No. 588, 1930, pp. 713-714.

In this article interesting details of measurements of temperatures in the geological substructure and their use in discovering petroleum deposits are discussed. The account on investigation appeared in a monograph entitled "The Case of the Varying Geothermic Depth Progression in the North German Salt Stocks," by H. Werner (Senior mining councillor of the Hanoverian administrative district of Celle.)

The author shows the warming influence of oil deposits by mentioning that, for example, in a borehole at Settorf in the Hamburg district, where a fairly strong influx of oil was met, the temperature increased 1° every 59 feet, in a gas well near Hamburg the 1° increase took place every 85 feet, whereas in a deep dry hole in the same neighborhood an interval of as much as 170 feet was required to produce the increase. (As a general rule the temperature of the earth increases by 1° C. every 105 ft.)

Although there might be other reasons causing the abnormal increase of temperature, petroleum deposits must also be regarded as special sources of heat in the earth's crust. The practical value of the discovery that petroleum deposits cause a rise in temperature in adjacent salt stocks can result, according to the author, in the fact that instead of putting down one deep borehole of, say, 3,000 feet, a number of shallow holes averaging 650 feet can be drilled. About 20 can be drilled for the cost of the one deep hole. They should be placed 300 to 500 yards away from the ascertained edge of the salt stock, at intervals of about 1,000 yards. At the spot where the greatest increase in temperature occurs, a deep hole should be drilled. The author adds that even if this procedure is not an absolutely reliable guide, it is at the moment the cheapest method promising success.--W. Ayvazoglou.

7. UNCLASSIFIED METHODS

DIE VERTEILUNG DER MASSEN AN DER ERDOBERFLÄCHE

(DISTRIBUTION OF MASSES ON THE SURFACE OF THE EARTH)

By L. Kober

Gerlands Beiträge zur Geophysik, vol. 25, No. 2, 1930, pp. 163-174.

An attempt is made here to find an explanation of the formation of the earth's surface and the distribution of the masses, based upon the whole of the

EXPERIMENTS RELATING TO SALT-DOME STRUCTURES

By Theodore A. Link

Bulletin of the American Association of Petroleum Geologists, vol. 14, No. 4, 1930, pp. 483-509.

The description and illustration of a series of laboratory experiments which were originally designed for the reproduction of miniature igneous intrusions are offered as suggestive material relating to the study of salt-dome structures. Graded materials, ranging from rigid to fluid, were injected from below into artificial sediments. Only such features as developed and were observed repeatedly are enumerated and suggested for consideration.—Author's abstract.

MODERN PROSPECTING ON AN INDUSTRIAL SCALE

By C. I. Tennberg

Chemical Engineering and Mining Review, vol. 22, No. 256, 1930, pp. 132-133.

The author discusses briefly the application of different geophysical methods of prospecting on an industrial scale. He draws special attention to the possibilities of the application of the electrical methods of prospecting and tries to answer the question: "What depths are attained in electrical prospecting for ores?" He says: "Unfortunately there is no simple and direct answer, because the depth is a function of at least three variables — the conductivity of the ground as a whole, the conductivity of the ore bodies to be located, and also the dimensions and shape of these ore bodies. Assuming a favorable case with lenticular bodies of solid sulphide ore in a practically insulating country rock, it might be stated that a good surface indication is still obtained if the upper surface of the ore body is not situated at a greater depth than half of its length.

"No greater depths than 1,000 feet have been attained. In prospecting for oil, electrical methods have been successfully applied to structural work only, and it has not been possible so far to locate oil directly."—W. Ayvazoglou.

FUTURE GEOPHYSICAL PROSPECTING IN AUSTRALIA

Editorial Note

Chemical Engineering and Mining Review, vol. 22, No. 257, 1930, pp. 100-101.

The opinions of two geophysical specialists who have left Australia recently after having investigated the possibilities of geophysical prospecting in Australia and in Tasmania are given: 1. Although the report of Mr. A. Broughton Edge is in the course of preparation it is expected that very important facts will be disclosed which will lead to future work being done in Australia; 2. According to Mr. Tennberg, conditions for electrical ore prospecting seem to be very favorable in western Tasmania. In New South Wales the Cobar area is of special interest, as well as the areas west of Broken Hill. There are also good prospects in Queensland. As to oil, the conditions generally seem to be more suited to electrical methods than to any other form of geophysical prospecting.—W. Ayvazoglou.

REVIEW OF THE GEOPHYSICAL METHODS OF PROSPECTING

By Donald C. Barton and E. Buhler Summers

The Geographical Review, vol. 20, No. 2, 1930, pp. 288-301.

The advancement in the methods of geophysical prospecting in general is noticed and a more detailed description of the four methods (gravitational, magnetic, electric, and seismic) widely used at present is given. The theories on which these methods are based and the attainments of the last years, especially for the discovery of salt domes, are discussed. The radioactive and geothermal methods, the application of which for practical purposes so far is of no importance, are mentioned very briefly. The last part of the article deals with the limitations of the geophysical methods of prospecting.--W. Ayvazoglou.

BIG POTENTIAL RESERVE ON GULF COAST

By Neil Williams

The Oil and Gas Journal, vol. 28, No. 49, 1930, pp. 42-43 and 118.

On the basis of figures, the author states that the Gulf Coast must be considered to be one of the largest potential petroleum reserves known to this industry. Within the past two years Gulf Coast production has been mounting steadily, until now it is the highest it has been at any time in its history. The increasing growth of discoveries must unquestionably be attributed to geophysics. Before the introduction of geophysics there were 42 known domes. Twenty-nine of these, or 69 per cent of the total, have been proved commercial producers. Using these figures as a guide Williams assumes that approximately 75 of the 110 geophysically discovered domes and prospects now known will eventually be commercial fields.

In the following table total domes, prospects, and fields are shown (some of them so far unproved as domes by the drill):

	Geophysical	Nongeophysical	Total	Total productive
South Texas.........	59	30	89	35
South Louisiana.....	51	18	69	24
Total.........	110	48	158	59

The following figures of geophysical discoveries by years show the development of the geophysical methods of prospecting:

Year	South Texas	South Louisiana	Total
1924.......	3	0	3
1925.......	4	2	6
1926.......	1	5	6
1927.......	5	9	14
1928.......	18	20	38
1929.......	24	15	39
1930.......	4	0	4
Total	59	51	110

Two maps, one of the Louisiana Gulf Coast field and another of the Texas Gulf Coast field, provided with marks for productive and nonproductive salt domes and structures, are given. A detailed list of geophysical domes and prospects discovered in South Texas and South Louisiana is added.--W. Ayvazoglou.

9. NEW BOOKS

Hazard, Daniel L. Results of magnetic observations made by the United States Coast and Geodetic Survey in 1928. U. S. Coast and Geodetic Survey. Serial No. 455, 35 pages. Government Printing Office, Washington, D.C., 1929; price 10 cents. Contents: 1. Introduction; 2, Distribution of stations, 3. Secular change of the magnetic declination, 4. Instrumental corrections, 5. Diurnal variation correction, 6. Arrangement of Tables, 7. Magnetic observations, table of results.

Hazard, Daniel L. United States magnetic tables and magnetic charts for 1925. U. S. Coast and Geodetic Survey. Serial No. 453, 136 pages, 4 maps. Government Printing Office, Washington, D. C., price 60 cents. Contents: 1. Introduction, 2. Available data, 3. Secular change data, 4. Secular change tables, 5. Reduction to epoch, 6. Contents of table of results, 7. Accuracy of tabular values, 8. Construction of the magnetic charts, 9. Lines of equal annual change, 10. Results of observations at repeat stations, 11. Tables for reducing results to January 1, 1925, 12. Observed values of magnetic elements and corresponding values of January 1, 1925.

Lazareff, P. P. Successes of geophysics (in Russian). Government publishing office, Moscow - Leningrad, 1929, 83 pages, 44 figures. Price, one ruble (51 cents). Contents: Chapter I, Mathematical and experimental methods in geophysics; (a) general methods of the investigation of nature; (b) methods of studying the form and the movement of the earth. Chapter II, On the experimental study of the processes occurring in the earth's crust. Chapter III, Movements occurring in the gaseous and liquid envelope of the earth.

U. S. Coast and Geodetic Survey. Magnetic Declination in Delaware, Maryland, Virginia, West Virginia, Kentucky, and Tennessee. Serial No. 457, 112 pages, 2 maps. Government Printing Office, Washington, D. C., 1929, price 20 cents. Contents: 1. Introduction, 2. Compass surveys, 3. Explanation of map showing change in declination, 4. Secular change tables, 5. Use of isogonic chart.

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